



The Solutions Network

Rochester, New York

World Class O&M – Metering Session

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Session Overview

- ❖ Identify when metering makes sense
- ❖ How to go about making the decision
- ❖ How to go about implementing the decision
- ❖ What you can expect to get out of a metering installation



Define Your Objectives

- ❖ Identify Conservation Measures
- ❖ Correct Costly Operating Practices
- ❖ Submeter to foster conservation
- ❖ Allocate costs
- ❖ Identify reliability issues – PQ
- ❖ Generate revenue through demand response
- ❖ Comply with legislated/mandated energy programs
- ❖ Facilitate commodity purchasing
- ❖ Develop enterprise-wide picture – Facility benchmarking

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Who Should Meter? – Cost Benefit

Develop a simple cost benefit analysis:

A 1 megawatt load in the Northeast uses about \$300,000 to \$500,000 per year in electric costs.

A basic, advanced metering installation may cost \$5,000 to \$15,000 over five years.

This represents less than 1% of energy costs.

For a smaller facility, 100kw load, the relative cost will be about 5% of your energy \$.

How big is your facility. Can you quantify the value to be realized?



Who Should Meter?

- ❖ Facility Flexibility - Can I change my process to take advantage of the knowledge gained?
- ❖ Cost Allocation - Will the tenants conserve if they are accountable for their usage?
- ❖ Decision Support - Will the additional information help me sell a project?
- ❖ Facility Benchmarking - Are some of my facilities negatively impacting my energy portfolio?
- ❖ Revenue Generation - Is it practical to utilize my emergency generator for load curtailment programs?



Who Must Meter

- ❖ Federal Metering Provisions in Energy Policy Act of 201x
 - All Federal buildings shall be metered or sub-metered
 - Metering should be “advanced”
 - Guidelines within 180 days of legislation
 - Metering costs and potential savings will guide applicability
 - Also, consider potential for conservation, O&M savings, energy procurement participation
 - Agency plans within six months of guidelines



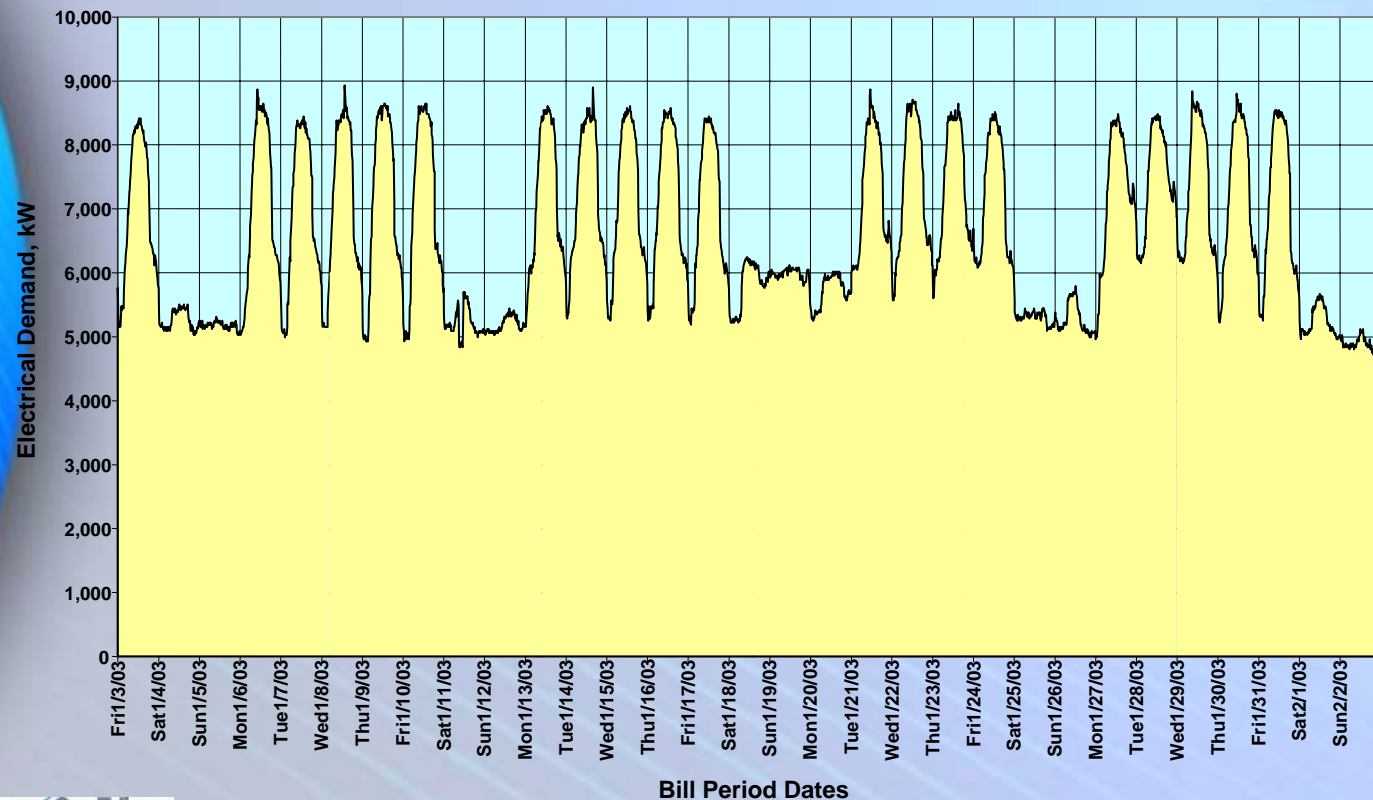
Basic Components of A Metering System

- ❖ What can you do with your profile data
 - Trending
 - Baselines
 - Normalize to weather
 - Identify demand spikes that increase bills
 - Measure compliance to demand response programs
- ❖ Energy Profile Analysis Tool
 - Live tour
 - Where can I get profile information
 - Inexpensive alternatives to installing advanced metering



Basic Components of A Metering System – The Demand Profile

Trend Data for the January Bill Period



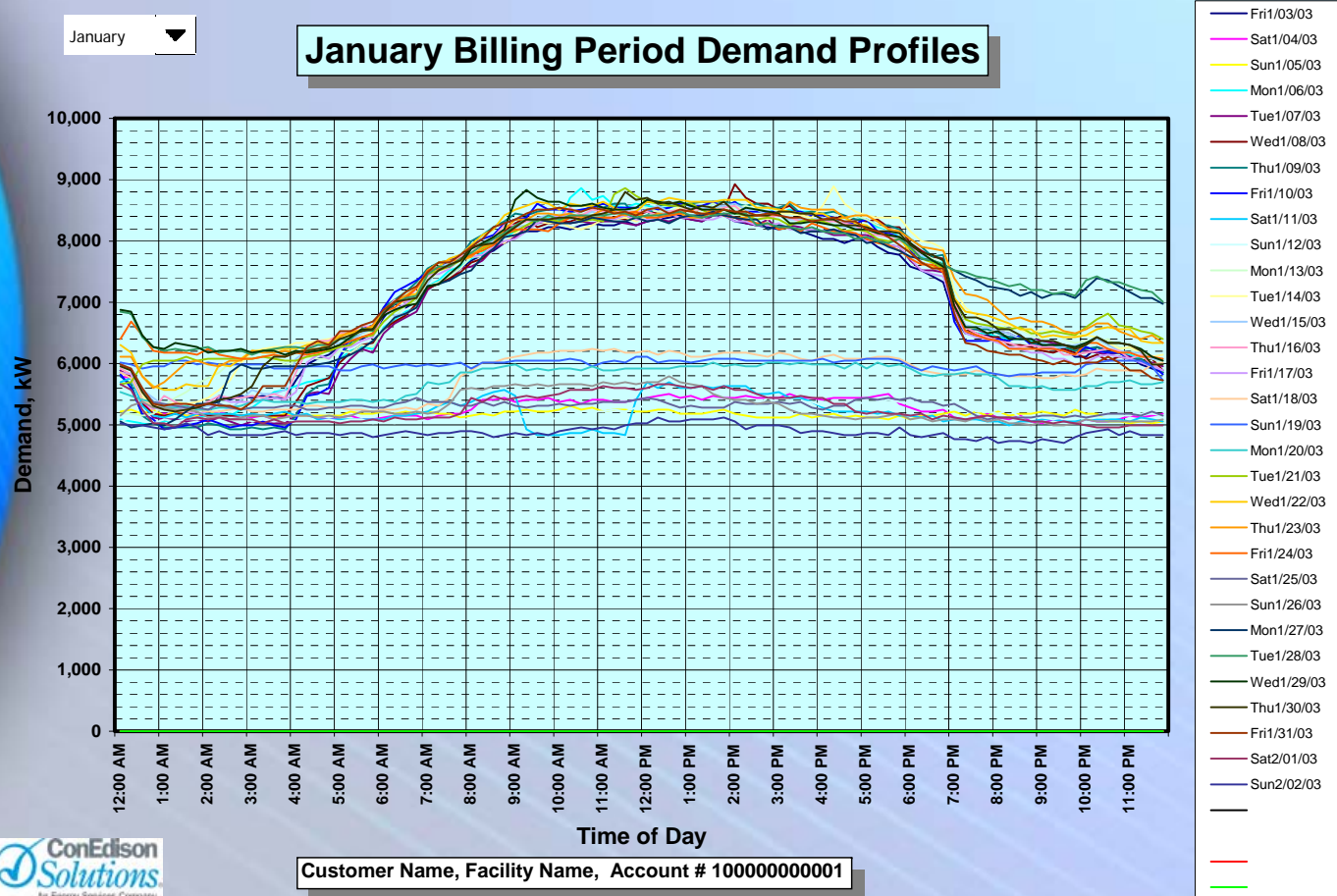
Customer Name, Facility Name, Account # 100000000001

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Profile Analysis Tool – Monthly Profile



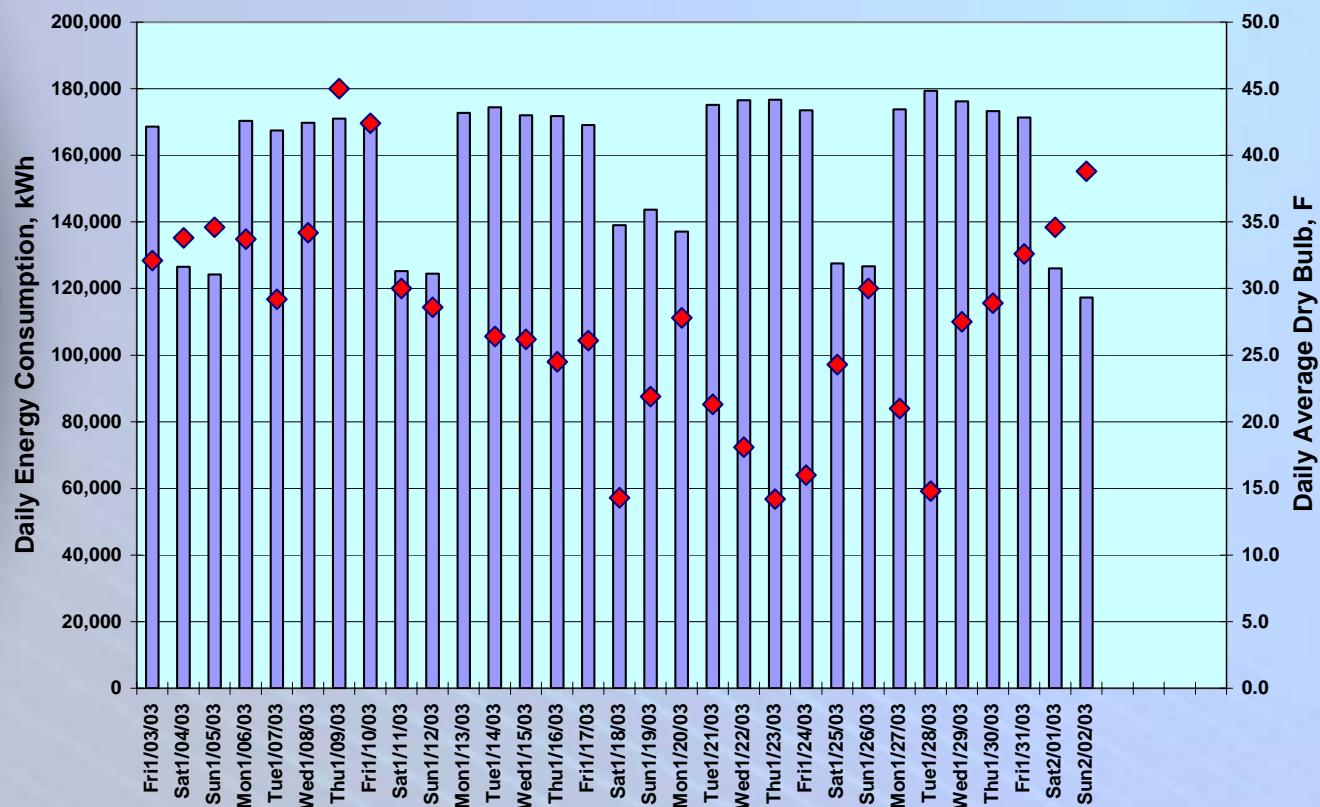
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Profile Analysis Tool – Energy vs. Weather

Daily Consumption for the January Bill Period



Customer Name, Facility Name, Account # 100000000001

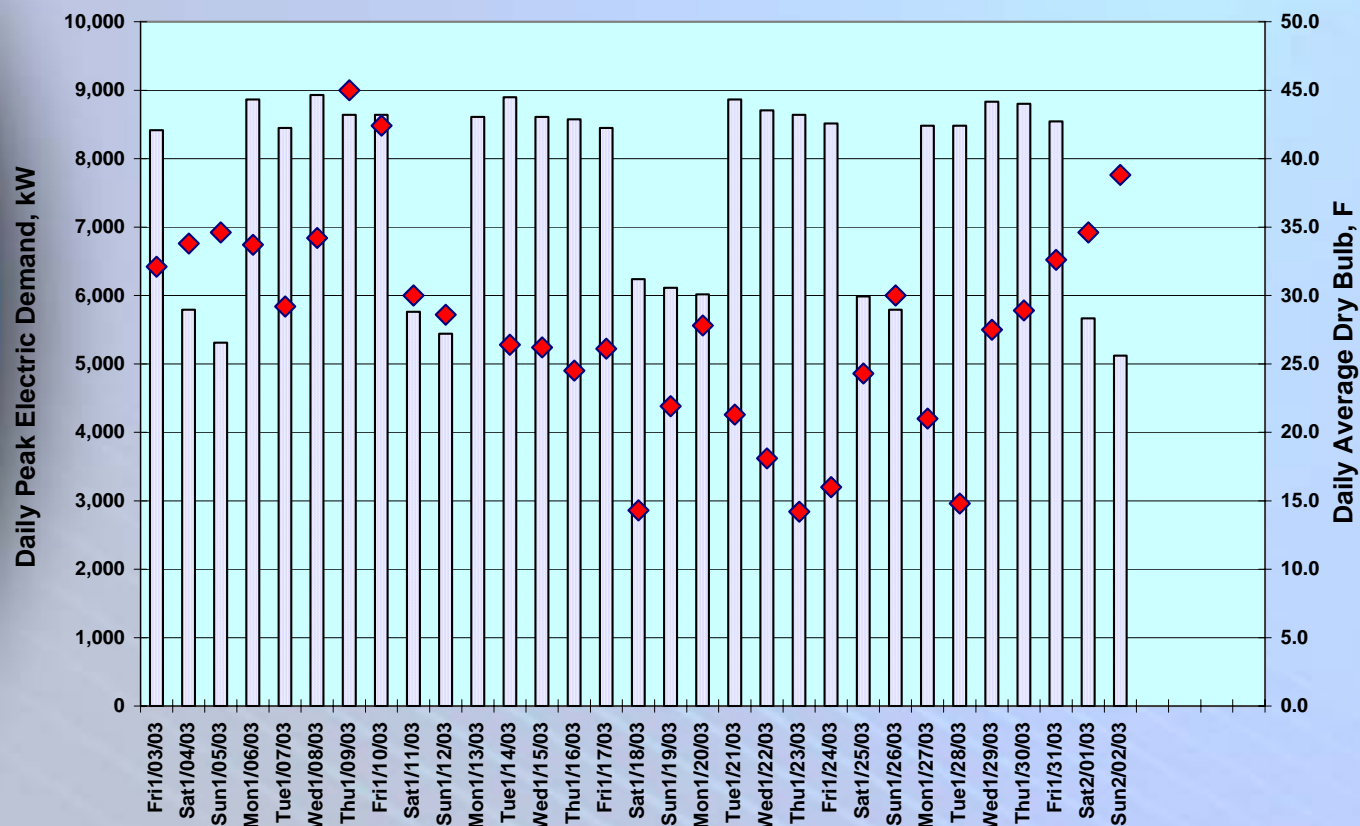
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Profile Analysis Tool – Demand vs. Weather

Daily Peak Demand for the January Bill Period



Customer Name, Facility Name, Account # 100000000001

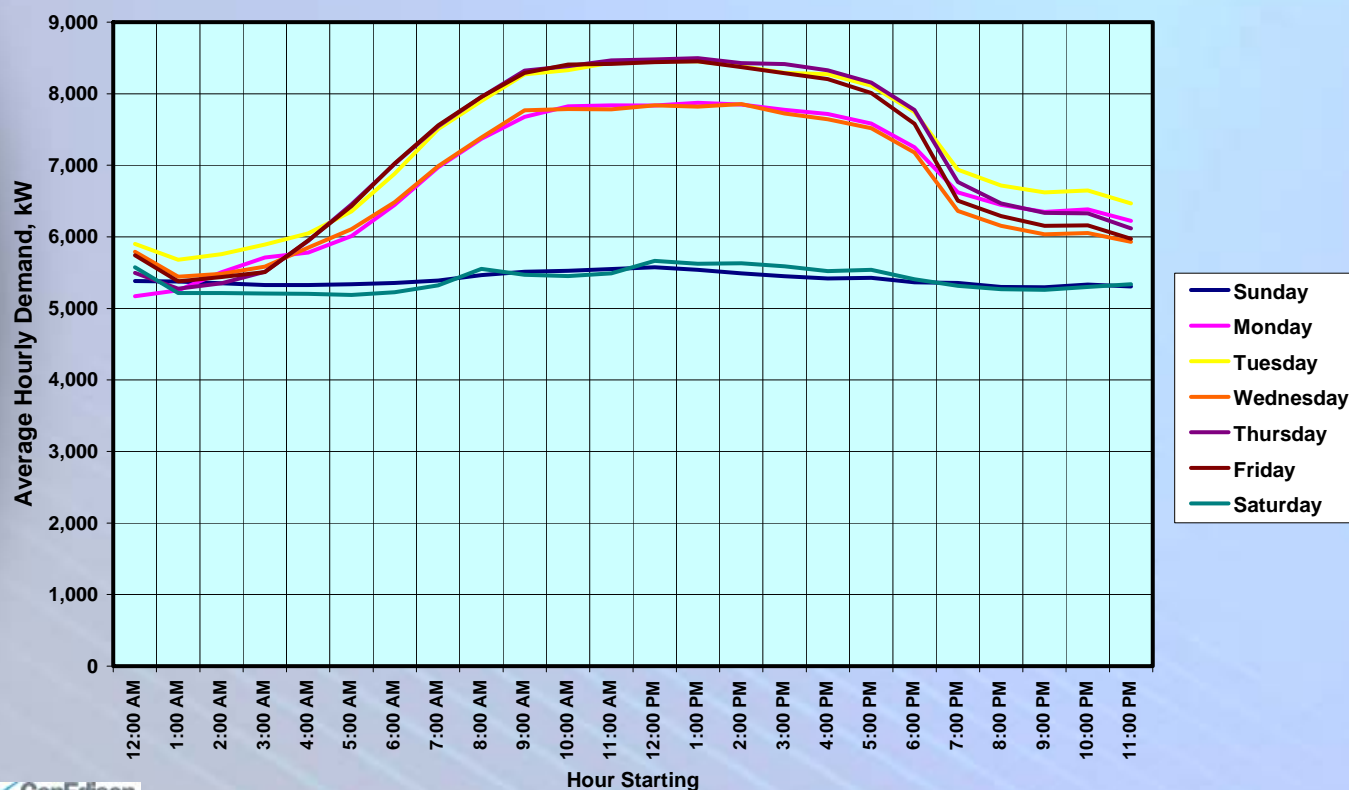
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Avg. Demand by Day of Week

Daily Average Demand Profiles for the January Bill Period



Customer Name, Facility Name, Account # 100000000001

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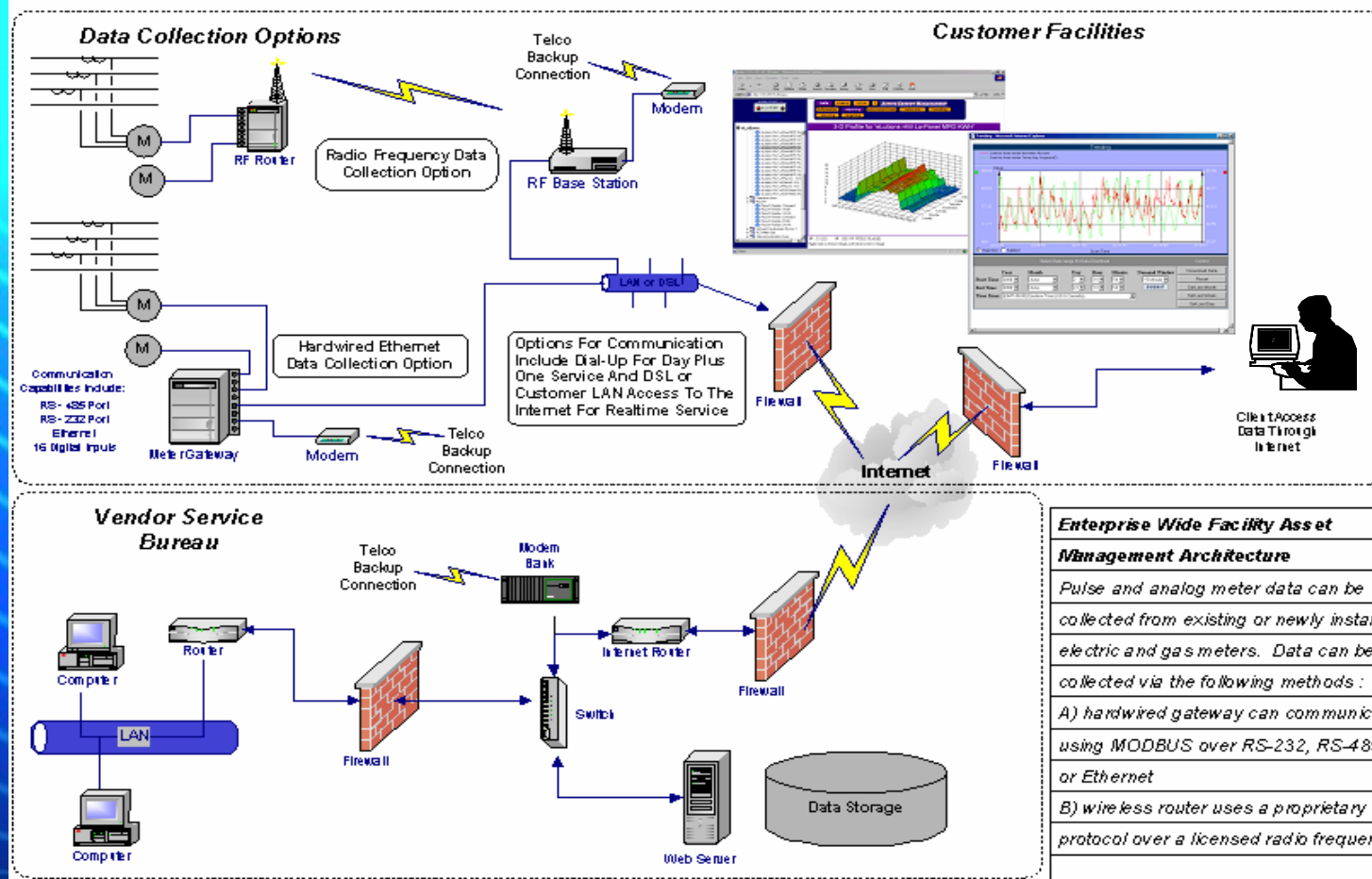
Basic Components of A Metering System

- ❖ A meter monitors energy usage and provides a data output containing energy information.
- ❖ A communication device receives this data and converts it to a stream or file of formatted data.
- ❖ The data file/stream is transferred via Ethernet, RF, Modem, Cellular to a base station/server.
- ❖ Data base is accessed via web enabled software



Basic Components of A Metering System

Sample - Metering Architecture



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Basic Components of A Metering System

Energy Analysis Software Modules

Trending	Tariffs
Profile analysis	Enterprise view
Normalization	Monthly bills
Billing/budgeting	Demand response
Security	Aggregation



Basic Components of A Metering System

Energy Analysis Software

- ❖ Web based
- ❖ Commercial Relationship
 - Client/server or ASP
 - Software on customer's server
 - Source code issues
 - Maintenance
 - High up front costs
 - Application Service Provider
 - Cheaper up front costs and with low volume
 - Subscription fee
- ❖ Data
 - Who owns it?
 - Open architecture vs. proprietary.



Economics of Metering

Typical Costs of Metering Installation –
Can you provide any of these services?

- ❖ *Audit to determine customer needs and equipment requirements*
- ❖ Engineering design
- ❖ Equipment purchasing and assembly
- ❖ *Installation labor*
- ❖ Commissioning
- ❖ Maintenance
- ❖ Software



Economics of Metering

Typical Installation Costs

- ❖ A single utility meter with pulse outputs and one year of web based presentation/analysis software \$5K-\$10K.
- ❖ A utility and gas meter with 12 utility sub-meters \$15K-\$40K plus \$1,000 to \$2,000 per year for web-based software subscription.



Advanced Metering

❖ Operations and Maintenance

- Building management systems
- Combine heat and power
- Emergency generation
- Remote control
- O&M oversight

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Procurement Process

- ❖ Encourage development of standardized RFP for Federal agencies
- ❖ RFPs for large agencies may include a design phase that enables the responder to design an agency-wide approach
- ❖ Start off with a pilot
- ❖ Put equal emphasis on meters and software

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More Information

FEMP O&M Web Site on
Advanced Metering

http://www.eere.energy.gov/femp/technologies/om_adv_metering.cfm

Includes NREL report – excellent
source of information.



Security Issues

❖ Dial up

- No Connection to Internet – very secure
- Difficult to get data more than once per day
- Higher Cost cost depending on size of data and communications costs
- Enables ASP relationship and lower software costs

❖ Ethernet

- Data transferred in open (encryption can be employed)
- Data available instantly
- Perception of security not as high
- Reality? As long as data is pushed out, security is high.
- Enables ASP



Security Issues

❖ DSL/Cable/High Speed Internet Connection

- No connection to Customer Network – very secure
- Higher Cost

Customer Network

- Customer owns software
- Software resides on the customer's server
- Data is pushed from behind firewall, no outside connection necessary.
- Data is sent using well know protocols (FTP,SMTP)
- Devices can be segregated from rest of network
- Lower Cost but software costs may be higher
- High internal security



Case Study: NAS North Island



Naval Air Station North Island
“Before” and “After” Metering

Augu



NAS North Island “Before” (c. 1990)

❖ Profile

- One of Navy's major carrier ports
- 3,000 acre air/sea/industrial complex
- 10 million SF of facilities
- population 30,000
- Host to 74 commands
- Host utility bill \$12M



NAS North Island “Before”

❖ “Before” Metering:

- Navy Public Works Center (PWC) provided utilities
- Only reimbursable tenants metered, e.g., ships
- Tenants paid for metered usage
 - Host paid for everything else
- Virtually no host meters
- No way to convey meter data to energy managers
 - E.g., Bldg 1482 metered but data unavailable



NAS North Island “Before”

❖ Impact:

- Public Works Officer and energy manager highly motivated but “working in the dark”
 - Unable to focus limited resources
 - Unaware of high-return opportunities
 - Forced to rely on “broadcast” measures
- Ineffective load-sheds
- No way to measure program effectiveness
- No way to check utility bills
- No way to M&V projects
- *No effective way to manage utility costs*



NAS North Island “After” (> 2000)

- ❖ NAS North Island even more vital
 - Now a major nuclear carrier port
- ❖ Metering improvements
 - Near-100% metering at facility level
 - Electricity, water, irrigation, gas
 - Most electric meters “time of use”
 - Major users metered for steam, air
 - On-line access to meter & billing data, electrical load curves
 - Data & charts readily available to all
 - Reports tailored to customers’ needs



NAS North Island “After”

❖ Impact of meters:

- Base now able to focus resources
 - Pin-point & correct problems & adverse trends
 - Identify high-return targets for building tune-ups, projects, management action
 - Prioritize efforts
 - identify billing errors
- Building operators have data they need to operate buildings efficiently
- Base can measure energy performance, take action & provide feedback
- Base can M&V projects, ensure continued savings
- *Base can effectively manage utility costs*

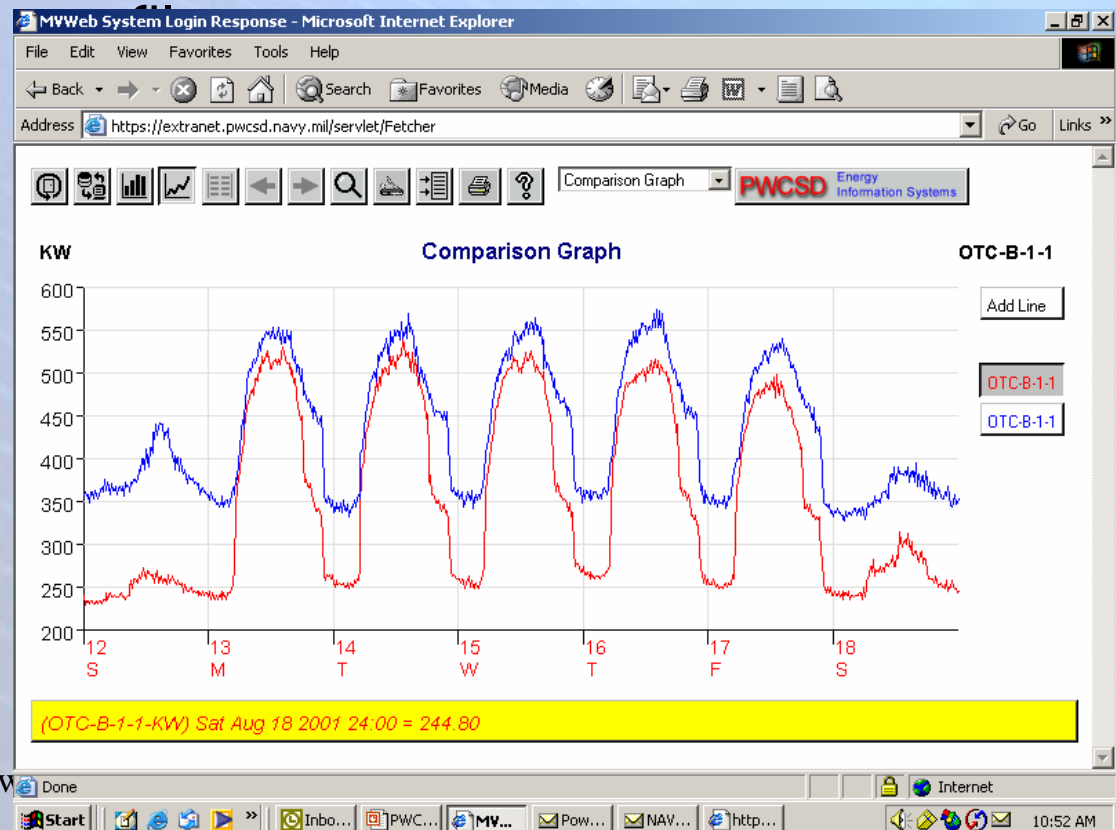


NAS North Island “After”

❖ Energy management tools available
“after”

➤ MVWeb load

- TOU meters
- Compare
 - Periods
 - Buildings
- Flexible



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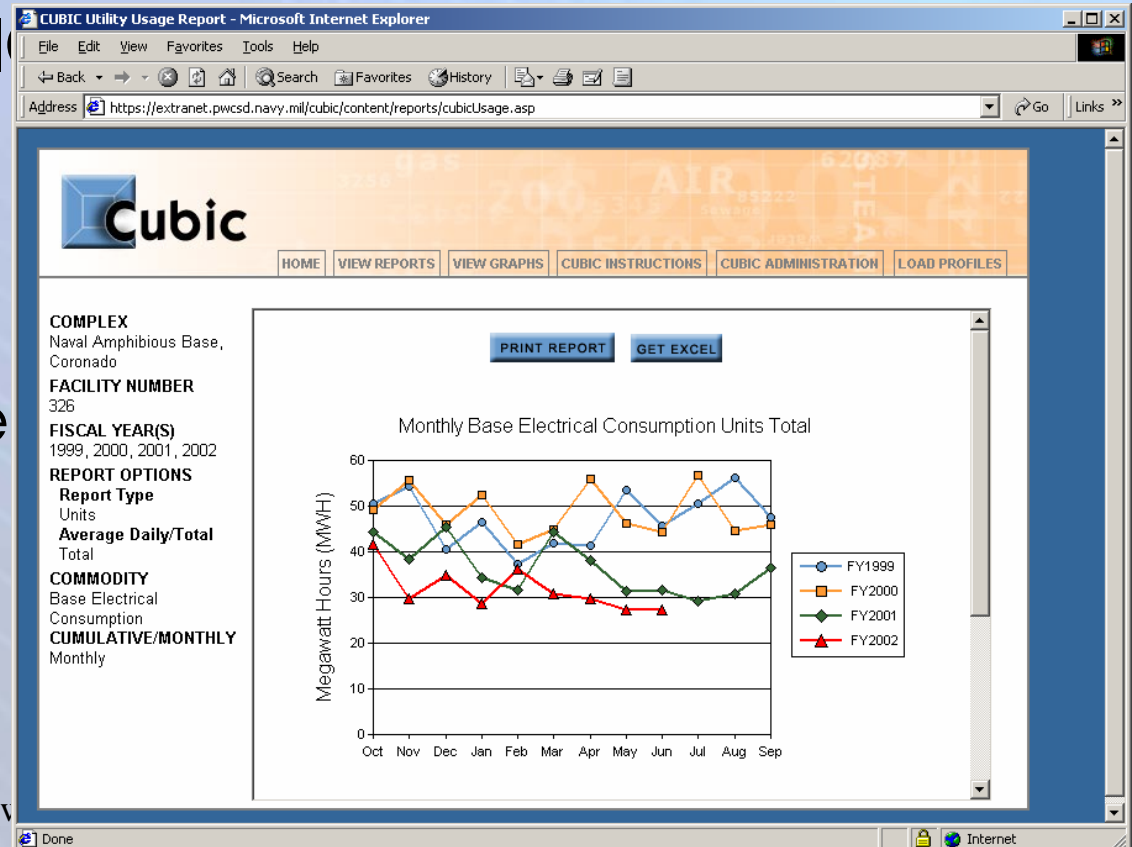
NAS North Island “After”

❖ Energy management tools available
“after”

➤ On-line CUBIC

- Cost
- Units
- Monthly
- Cumulative
- By meter
- All utilities

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NAS North Island “After”

❖ Energy management tools available
“after”

➤ On-line CUBIC

CUBIC - Microsoft Internet Explorer provided by Navy Marine Corps Intranet

Address: <https://extranet.pwcsd.navy.mil/cubic/content/allocation/cubic.asp>

Cubic

CUBIC Allocation Report Complex: NASNI
BYM: 6/1/2004

FISCAL YEAR: 2004
SET YEAR

COMPLEX: NASNI
BYM: June 2004
SET COMPLEX/BYM

JON: All JON
FACILITY ID: 1
COMMODITY: All Commodities
GENERATE REPORT

DOWNLOAD EXCEL

FacNo 1	FacNo 2	FacNo 3	JON	Com Type	Units Used	Units	Rate (\$)	Charge (\$)
1			163831912004	FW	0.3	KGAL	\$6.40	\$1.92
The Total For JON 163831912004 is: \$1.92								
1			163832112004	SE	0.3	KGAL	\$4.83	\$1.45
The Total For JON 163832112004 is: \$1.45								
1			163882612004	EDN	10.2	KW	\$0.57	\$5.81
1			163882612004	EDC	9.4	KW	\$2.02	\$18.99
1			163882612004	ESP	2.4	MWH	\$8.65	\$20.76
1			163882612004	EDC	0.7	KW	\$8.72	\$6.10
1			163882612004	ESP	0.1	MWH	\$8.82	\$0.88
1			163882612004	EP	0.4	MWH	\$26.52	\$10.61
1			163882612004	EP	0	MWH	\$38.98	\$0.00
1			163882612004	EL	0.3	MWH	\$107.34	\$32.20
1			163882612004	EL	4.1	MWH	\$107.73	\$441.69

Start | Internet | Inbox - Microsoft Ou... | Removable Disk (E:) | E2004 Metering Pres... | PWCSO Metering FE... | CUBIC - Microsoft ... | 10:50

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NAS North Island “After”

❖ Energy management tools available
“after”

➤ On-line “Push Bills” to tell customers exactly
what they are

CUBIC PushBill - Microsoft Internet Explorer provided by Navy Marine Corps Intranet

Address: https://extranet.pwcsd.navy.mil/cubic/pushbill/content/clientReportFrame.aspx?p1=N0024219&p2=76528182

Cubic

NAVY REGION SOUTHWEST-NBSD

PWC Complex Summary

Client: NAVY REGION SOUTHWEST-NBSD (N0024219) Billing Month: June 2004
Commodity: Electricity
Complex: Fleet Industrial Service Center, San Diego
Facility Breakout:

Total for Facility Number: 1							
Fiscal Year	Current Month Usage	Units	Current Month Avg Daily Usage	Year-to-Date Usage	Year-To-Date Avg Daily Usage	Current Month Cost	Year-to-Date Cost
2004	403.9	MWH	14.4	3,798.4	13.9	\$56,915	\$517,475
2003	352.0	MWH	12.6	3,174.9	11.6	\$61,701	\$568,588

Total for Facility Number: 1-CATTS							
Fiscal Year	Current Month Usage	Units	Current Month Avg Daily Usage	Year-to-Date Usage	Year-To-Date Avg Daily Usage	Current Month Cost	Year-to-Date Cost
2004	17.5	MWH	0.6	176.8	0.6	\$2,291	\$22,288
2003	18.4	MWH	0.7	162.5	0.6	\$3,108	\$28,466

Total for Facility Number: 8							
Fiscal Year	Current Month Usage	Units	Current Month Avg Daily Usage	Year-to-Date Usage	Year-To-Date Avg Daily Usage	Current Month Cost	Year-to-Date Cost
2004	0.1	MWH	0.0	0.8	0.0	\$13	\$106

Done

Start | Internet | Inbox - Microsof... | Removable Disk... | E2004 Metering... | PWCSD Metering... | CUBIC PushBill... | Activity: N0024... | 10:53

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NAS North Island “After”

❖ Energy management tools available
“after”

➤ “Push Bill” spreadsheets to sort & analyze data,
identify targets & anomalies, find billing errors,

prioritize efforts

BASE	Bldg	YTD 2003 (KWH)	YTD 2004 (KWH)	Incr (Decr) (KWH)	% Incr (Decr) (KWH)	2003 COST YTD	2004 COST YTD	Incr (Decr) Cost	YTD 2003 \$/KWH	YTD 2004 \$/KWH	FY04 Budget Impact of Incr (Decr)
FISC	1	3,174,900	3,798,400	623,500	20%	\$568,588	\$517,475	(\$51,113)	\$0.179	\$0.136	\$84,943
FISC	12	285,700	486,000	200,300	70%	\$52,235	\$67,454	\$15,219	\$0.183	\$0.139	\$27,800
NAVSTA	55	450,200	602,800	152,600	34%	\$73,375	\$74,240	\$865	\$0.163	\$0.123	\$18,794
NAVSTA	3339	702,700	837,200	134,500	19%	\$41,425	\$113,962	\$103,199	\$0.059	\$0.136	\$18,309
NAVSTA	116	929,200	1,046,800	117,600	13%	\$154,777	\$132,314	(\$22,463)	\$0.167	\$0.126	\$14,864
PHWY	127	506,400	617,300	110,900	22%	\$118,129	\$117,555	(\$574)	\$0.233	\$0.190	\$21,119
NAVSTA	3418-A	187,200	288,400	101,200	54%	\$29,463	\$35,300	\$5,837	\$0.157	\$0.122	\$12,387
NAVSTA	TUG-BOATS	0	93,800	93,800	n/a	\$0	\$10,989	\$10,989		\$0.117	\$10,989
NAVSTA	STLTS-X,Y,Z	52,900	135,700	82,800	157%	\$8,210	\$15,638	\$7,428	\$0.155	\$0.115	\$9,542
NAVSTA	3338	106,600	184,800	78,200	73%	\$20,325	\$23,432	\$3,107	\$0.191	\$0.127	\$9,915
NAVSTA	3143	1,051,700	1,129,700	78,000	7%	\$176,693	\$140,998	(\$35,695)	\$0.168	\$0.125	\$9,735
NAVSTA	261	0	72,200	72,200	n/a	\$0	\$8,948	\$8,948		\$0.124	\$8,948
NAVSTA	3290	665,300	737,500	72,200	11%	\$107,847	\$89,266	(\$18,581)	\$0.162	\$0.121	\$8,739
NAVSTA	3202	596,900	668,500	71,600	12%	\$98,917	\$84,769	(\$14,148)	\$0.166	\$0.127	\$9,079

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NAS North Island “After”

❖ Energy management tools available “after”

- Knowledgeable CUBIC staff making continuous improvements
 - Faster, more useful reports
 - More capabilities
- Accessible CUBIC data base
- Capable CUBIC techs
 - Keep allocations current
 - Make the system work
 - Respond to user concerns